

CLAIMS

What is claimed is:

1. A device for the electrodeionization (EDI) in the demineralization of aqueous solutions, comprising:

a) several cation and anion-exchanger membranes (1; 2) arranged alternately and in spaced relationship and being assembled to form a stack, with the spaces between the membranes forming compartments through which the aqueous solution can be conducted,

b) a cathode (3) and an anode (4) disposed at opposite end membranes (1, 2) of said stack for establishing an electrical DC voltage across said stack,

c) a mixed bed of cation and anion exchanger resin particle fractions (9, 8) disposed in at least some of said compartments, that is the demineralization compartments (18), in which, upon application of said DC voltage to the cathode (3) and anode (4), ions are enriched by permeation from the adjacent compartments, the concentration compartments (17), through the respective exchanger membranes into the demineralization compartments (18),

d) liquid supply means (5) and discharge means (6, 7) at opposite ends of said stack for supplying the aqueous solution to, and removing the solutions separately from, said compartments,

e) said ion exchanger resin particles of one of said fractions including a magnetic material so as to provide them with magnetic properties, and

f) means (15,16) for generating a magnetic field with field lines which extend essentially normal to said ion exchanger membranes for orienting the magnetic resin particles

and arranging them in chains between said ion exchanger membranes.

2. A device according to claim 1, wherein all compartments (10) of said stack contain mixed bed resins.

3. A device according to claim 1, wherein said device includes at least one magnet (15) for generating said magnetic field.

4. A device according to claim 3, wherein said magnet is an electromagnet.

5. A device according to claim 3, wherein said magnet (15) is a superconductive electromagnet.

6. A device according to claim 3, wherein said magnet (15) is a permanent magnet.

7. A device according to claim 1, wherein said ion exchange resin particles of one of said fractions include additives with mainly hard-magnetic properties and said magnetic field is switchable so that, upon alignment and proper orientation of the magnetic ion exchanger resin particles filling said compartments (10), the magnetic field can be switched off.

8. A device according to claim 1, wherein said ion exchange resin particles of one of the two fractions include additives with mainly soft-magnetic properties such that the ion exchange resin particles of said one fraction become magnetic only when exposed to an electric field.